A CATALOG OF HIGH-IMPACT WINDSTORMS IN SWITZERLAND SINCE 1859

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Learn from past severe windstorms

- Impact studies and projections "What harm could a historical storm do today or in a future climate?"
- Forecasting and warning \bullet "Do high-impact windstorms have typical meteorological features?"
- **Climatological studies** "How has storminess changed over time and space (trends, weather



2. Challenge

Merge heterogeneous information

- Wind-based data is insufficient - Historical wind observations: sparse, inhomogeneous, mean wind speeds - Global reanalyses: resolution over the Alps 200 km \rightarrow use for Validation
- Impact-based data is heterogeneous - Descriptive information \rightarrow **Indexing** (Translation into severity classes) - Quantitative data \rightarrow **Normalization**



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types, disaster gap)?"

(Adjustment to modern conditions)

3. Compilation

1. Motivation

Benchmark differing data types

- **Historical Climatology Indexing** for descriptive series: 4 classes ~ impact anomaly
- **Extreme Value Analysis** for quantitative series: 4 classes ~ return periods



- Extreme, large-scale devastation >1 annual timber harvest >1 % of total insured value
- Devastating and numerous damage to massive structures (walls, quays, entire forest plots)
- Substantial and numerous damage to weaker structures (roofs, tiles, windows)
- Isolated, small damage to roofs and trees

4. Validation



✓ The perilous winter storms are most likely captured



- ✓ Probable undersampling in the 1970s and 1940s, and oversampling in the 1920s, however
- ✓ There are concurrent decadal-scale periods of high and low storminess:
- \checkmark High storminess from 1900 to 1920, low around 1940, medium around the mid-century, low in the 1970s, high in the 1990s and calmer since



5. Applications

Generate novel numerical products

- **Downscaling and loss modeling** e.g., Foehn storm in 1925
- Wind hazard map in collaboration with Federal Office for the Environment and MeteoSwiss



3rd downscaling



Resolution

kg

3

6. Conclusions



 \checkmark We provide a catalog of approx. 120 (winter) windstorms since 1859.

- ✓ Decadal-scale variations in storminess are reflected in impact severities.
- ✓ The catalog can be used for a range of practical and scientific applications.



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